INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 1999	**Park:** Shenandoah NP
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Permit#:
SHEN1999N-232

Park-assigned Study Id. #:
unknown

Project Title:
Standardized Monitoring Methods For Amphibians In National Parks And Associations In Time And And Space Between Amphibian Abundance And Environmental Stressors

Permit Start Date: Jan 01, 2000	**Permit Expiration Date** Jan 01, 2000
Study Start Date: Jan 01, 1998	**Study End Date** Jan 01, 2000

Study Status:
Completed

Activity Type:
Monitoring

Subject/Discipline:
Herpetology (Amphibians / Reptiles)

Objectives:
Develop protocols for long-term monitoring of amphibian populations in relation to environmental factors at Shenandoah National Park. Document amphibian (egg, larva, adult) distribution and abundance using various survey methods (area- and time-constrained searches in plots and along transects, artificial cover objects, leaf litter bags, 1 m2 quadrats, chorus surveys). Amphibians are measured and sexed in the field and any deformities or diseases are documented. Population size estimates are assessed using mark-recapture (visible implant fluorescent elastomer) and removal techniques. Amphibian distribution and abundance are analyzed in relation to water quality (temperature, pH, acid-neutralizing capacity, conductivity), soil parameters (moisture, pH) and habitat variables (e.g., streambank composition). A study of Plethodon shenandoah genetics in the Park was completed and monitoring methods for this species were tested.

Findings and Status:
Distribution and abundance of 17 amphibian species was documented in the Park from March to October 1998 and 1999. Amphibian species included 7 anurans (Bufo americanus, Bufo woodhousei fowleri, Pseudacris crucifer, Rana sylvatica, Rana palustris, Rana catesbeiana, Rana clamitans) and 10 salamanders (Ambystoma maculatum, Desmognathus fuscus, D. monticola jeffersoni, Eurycea bislineata, Gyrinophilus porphyriticus, Notophthalmus viridescens, Plethodon cinereus, P. cylindraceus, P. shenandoah, Pseudotriton ruber). In 1999, museum specimens of 16 individuals representing 5 species were collected and accessioned at the National Museum of Natural History in Washington, D.C. In the spring of 1999, chorus surveys were conducted at Big Meadows and Hogcamp Swamp. Population estimates of terrestrial salamanders were conducted at 24 plots (15-20 m2) in five areas of the park (Headquarters, Shenk's Hollow, Pocosin, Tanner's Ridge, Fisher's Gap). Plots were surveyed on approximately a biweekly basis during the day in the spring and fall. All natural cover objects (NCOs; rocks and logs) were overturned and counted to check for salamanders, which were marked using visible implant fluorescent elastomer (VIE) (4 colors at 4 body locations). Soil moisture and pH, air and soil temperatures, vegetation parameters, and weather data were recorded in each plot. The Headquarters and Shenk's Hollow plots represented burn and control areas to look at salamander populations before and after a prescribed burn which took place in October 1999. Five paired burn-control plots were surveyed 6 times before the burn and 4 times after the burn. We found significantly fewer and smaller redback salamanders (Plethodon cinereus) after the burn in the burn plots as

compared to the control plots. The Pocosin, Tanner's Ridge, and Fisher's Gap plots were established to look at the effect of artificial cover object (ACO) additions on redback salamander populations. ACOs are currently being proposed as a good monitoring technique, because they provide a more standardized sampling unit, are easier to overturn, may make salamander detection easier, and do not disturb the natural habitat. We found higher salamander densities and recapture rates under ACOs as compared to NCOs. In 1999, population estimates of streamside salamanders were assessed at six streams using capture-recapture (6 weekly surveys) followed by removal sampling (6 times over 2 days). Recapture rates were low, and population estimates using capture-recapture tended to be higher than those from removal estimates. During the summer, we surveyed amphibians at 48 stratified random terrestrial plots (10 m2) and 48 streamside transects (26 x 1 m) throughout the Park. The sites were chosen randomly and stratified based on elevation (low = < 2,000 ft., high = > 2,000 ft.), bedrock (basaltic, granitic, siliciclastic), and aspect. We will look at amphibian species richness and abundance at these sites in relation to a suite of environmental factors. Tail tips of Plethodon shenandoah and P. cinereus were collected from 3 locations in the Park for mitochondrial DNA analyses. The genetics study was meant to determine how distinct the three P. shenandoah populations are from one another and whether there is evidence for genetic introgression from P. cinereus into the core P. shenandoah areas. Initial results suggest that the three P. shenandoah populations are very similar genetically and that there is no evidence for genetic introgression.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

Yes

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
180000	0

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
n/a	0